Interactive Persuasive Learning for the Elderly: A Conceptual Model

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Abstract
Interactive media technology promotes self-directed and active learning approaches and has the capability to foster the learning process. Furthermore, the emergence of persuasive technology has increased the application of interactive media in learning in a variety of ways. Persuasive technology can be implemented in the design and development of a computer application that can persuade users to change their attitudes and behaviours so as to accelerate the learning process. The aim of this paper is to develop a conceptual model of an interactive persuasive learning system to encourage the elderly to use a computer application for learning. Based on a review of the related literature on persuasive technology and interactive media, a conceptual model is developed. The proposed conceptual model will be helpful in the design and development of an interactive media system that encourages engagement in learning processes among the elderly.

Keywords: interactive media; persuasive technology; interactive persuasive learning; elderly

1. Introduction

A plethora of researchers have discussed the elements of an interactive media system that has a persuasive impact on users such as motivation (Lehto & Oinas-Kukkonen, 2011; Fogg, 2003), experience (Berkovsky et al., 2012; Fogg, 2003), cognitive process comprehension (Oinas-Kukkonen & Harjumaa, 2009; Fogg et al., 2007) and others. Each researcher has

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described the elements from their point of view in relation to previous studies; however, the common aim of this paper is to reveal the best ways and the most-needed elements for engaging, attracting and persuading elderly to adopt the targeted behaviours and attitudes through interactive media systems. There are many interactive persuasive elements, and this paper focuses on four key elements, namely; motivation, cognitive process, emotional appeals, and experience.

In recent years, there has been vast interest in discovering how computer and information technology influences, motivates and persuades people to change their behaviours and attitudes. Known as persuasive technology, it promotes an interactive technology that can change a person's attitudes or behaviours (Fogg, 2003). Designing up-to-date human-computer interaction requires the skill of motivating and persuading people through the developed products or applications (Fogg et al., 2007), as persuasion is central to the concept of persuasive technology. Fogg coined the term "captology", a study of computer systems that have been planned by designers to intentionally persuade users in relation to a focused behavioural or attitude change, not computer systems that cause changes to occur unintentionally (Oinas-Kukkonen & Harjumaa, 2008).

Fogg (2003) describes three elements in computer technology that can be used as persuaders, namely, the computer as a tool, as a medium and as a social actor; together, these are referred to as the functional triad as shown in Figure 1. According to Fogg et al. (2007), as a tool, a computer is designed to influence people in changing their behaviours and attitudes by increasing people's abilities or by making a task easier. The second element in the functional triad refers to the power of simulations generated by computer programs. The simulated environment gives the user experiences that can influence their behaviours and attitudes (Fogg et

al., 2007). The third element in the functional triad emphasises computers as persuasive social actors. In relation to this element, previous studies have discussed persuasiveness in interactive media applications (Looije et al., 2010). It is clear that a well-designed interactive media application that has been intentionally implemented to persuade people to change their behaviours and attitudes can be an effective persuader (Fogg, 2003; Fogg et al., 2007).

In learning, interactive media emphasises the combined use of text, graphics, animation, video and audio elements to construct knowledge and provide an active learning environment to the learners (Mayer, 2005). Hence, interactive media is defined as the combinations of various types of digital media elements such as text, images, sound, animation and video that can persuade users to use interactive media technology for learning and to convey information for better learning and comprehension in an interactive way.

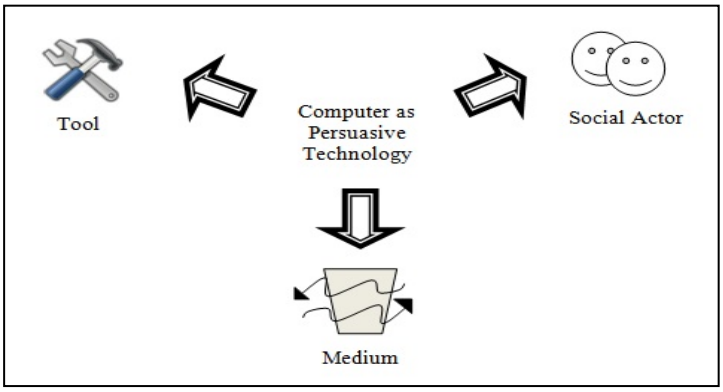

Figure 1. Persuasive elements in computer technology

Interactivity can be designed in several levels (Mutalib, 2007). Norhayati (1999) classifies interactivity into three levels, namely, low, intermediate and high. Rhodes and Azbell (1985) also classify interactivity into three levels, namely, reactive, coactive and proactive.

The learning context for the elderly is seen to be different from pedagogical learning and is referred to as andragogy or “adult learning” (Queensland Occupational Therapy Fieldwork Collaborative, 2005). One of the principles proposed by Knowles (1991) is that adults are

internally motivated for learning something. A learning process can attract elderly if the learning benefits them. A meaningful experience in learning can be created in myriad ways, and conveying the learning in an interactive way can be one of the approaches used. Instead of only using the traditional method in conveying information, the use of interactive media in learning exposes learners to both auditory and visual channels. Furthermore, both systems can significantly increase the ability of learners to memorise and retrieve information and can deepen their understanding.

The combination of multiple elements seems to increase the user's engagement with the material that is presented. Dyer and Observe (1996) state that, on average, a learner will retain 10% from what they read, 20% from what they hear, 30% from the pictures they see and 50% from watching in a learning process. Many studies have focused on elders and their use of technology, including studies on elderly-based system design (Barberà-Guillem et al., 2014) and multimodal interfaces for the elderly (Rodrigues et al., 2014). The literature includes several studies that propose a variety of interactive media systems and tools to maximise the impact of persuasion on the elderly (Looije et al., 2010). However, very few studies have focused on the learning area. As such, in order to develop a persuasive computer application for the elderly, the best suite of interactive media features should be identified and highlighted. Four interactive media features have been selected from previous studies, namely, layout and consistency, simulation, navigation, and minimal input devices. The following sections elaborate on the proposed conceptual model of an interactive persuasive learning system for the elderly.

2. The Interactive Persuasive Learning Conceptual Model

This paper proposes a conceptual model that is based on three broad categories: interactive media features (layout and consistency, simulation, navigation and minimal input device),

interactive persuasive elements (motivation, experience, cognitive and emotional appeal) and learning outcomes (performance and satisfaction). The conceptual model is shown in Figure 2. The details of the categories in the model are explained in the following sub-sections.

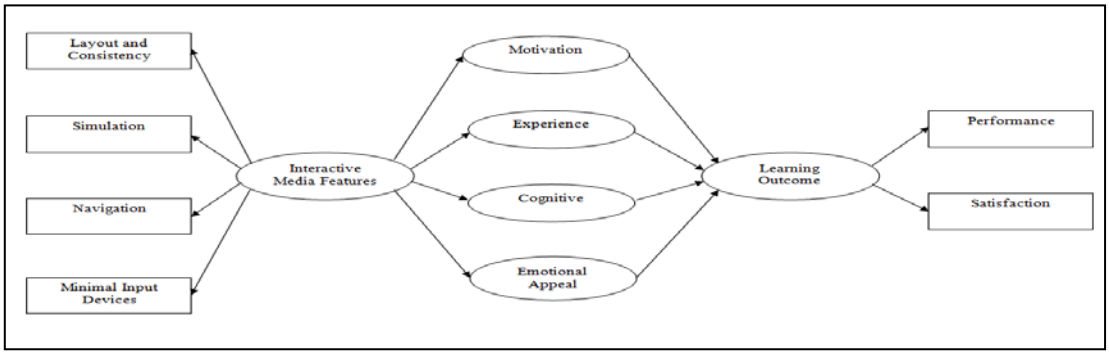

Figure 2. The conceptual model of interactive persuasive learning for the elderly

2.1. Interactive Media Features

Nai-Chi (2010), Hawthorn (2003) and other researchers have found that good interface design or layout encourages an easy, natural and engaging interaction between a user and a system. Furthermore, computers and applications can currently be accessed by users from a variety of social levels; therefore, there is a need to consider the design that suits the targeted group (Wirtz et al., 2009). According to Hawthorn (2003), the layout of a screen design for the elderly should be simple so that they can easily become familiar with the layout and what it conveys. Previous studies also emphasise several features for designers and developers to take into consideration when designing for the elderly, such as fonts, colours, the positioning of media features (Stemler, 1997), and buttons (Muhammad Mehrban, 2010). At the same time, the layout design (text including the headings and content, colours, navigations and other appropriate elements) should maintain consistency throughout all scenes (Muhammad Mehrban, 2010). Mayer (2001) point out that good layout and consistency facilitates the cognitive process of a learner in a learning environment. In addition, it motivates a learner to learn and offers them better comprehension (Hawthorn, 2002).

Simulation is a computer technique that mimics the real world by transferring the condition or environment into a computer-based system (Zulkifli et al., 2010). Simulation can be as simple as a two-dimensional environment or as complex as a three-dimensional environment (also known as “virtual reality”) (Fogg, 2003). Previous studies have shown that the elderly face more difficulties related to spatial knowledge (Sjölinder et al., 2005). Spatial knowledge includes knowledge about landmarks or reference points, route knowledge and survey or configural knowledge (Sjölinder et al., 2005). Virtual reality can be used as an alternative solution to cope with a real problem. The most important potential of virtual reality is the facilitation of spatial knowledge development. In addition, virtual reality increases learners’ understanding and promotes experiential learning in a learning process as it provides a higher level of active learning participation and experience through the learners’ control (Yusoff, 2012). Repeated interaction in the virtual reality environment in a learning process can increase the learners’ familiarity with elements in the real environment such as routes, objects and landmarks (Yusoff, 2012).

Computer system navigation has also been discussed in the literature as an influential factor in engaging users in a developed system (Stemler, 1997). In developing a computer application for the elderly, navigation is one of the important features to be given a high level of consideration. A complex navigational system, particularly in a complex interactive multimedia system, requires a higher mental model for remembering more about the location features in order to access other pages (Stemler, 1997). Thus, a simple and easy navigational system is required when the elderly interact with computer systems.

Last but not least, one of the most challenging tasks for the elderly when interacting with computers is to navigate by using the input device (Wood et al., 2005). Even though the elderly

may be interested in using computers for learning, the use of physical devices might reduce their learning motivation, particularly for the novice elderly users. Yusoff (2012) and Wood et al. (2005) suggest using the most fundamental input devices to enable the elderly to interact with the computer system, such as the mouse and keyboard. Previous studies have shown that the elderly who has no or little experience with computers will typically have problems using the mouse; however, needing to use the device in a computer system allows them to continuously practise using the device.

2.2. Interactive Persuasive Learning Elements

Motivation is related to how individuals can achieve certain goals, how they initiate, mediate and sustain activities, and is normally magnified by their effort and choices (Noor, 2012). Motivation has been found to have an influence on the effectiveness of a learning process. In order to encourage the use and to change the perceptions and behaviours towards an interactive media learning application, it is essential to understand how the designers can accelerate the learners' motivational level through the medium (Noor, 2012). Muller et al. (2006) agree that it is important to study the ways in which interactive or multimedia learning can enhance the learners' motivational levels. Previous studies have shown the remarkable achievements of the interactive media features used in the learning process. Interactive media provides a media-rich learning environment (Neo & Neo, 2004) that can also increase the motivational level related to the presented learning information (Noor, 2012). Therefore, building on the features of interactive media such as the layout and consistency, simulation (virtual reality), navigation and minimal input device use, motivational value is another factor that can be correlated in the attempt to change the individual attitudes and behaviours in the learning process.

Interactive media is capable to accelerate users' experience while interacting with a computer-based learning system (Fogg, 2003; Mayer, 1997). Previous studies have shown the importance of learners' control and active learning in computer-based learning (Lee et al., 2010). As stated by Kinzie et al. (1988), learners may learn better when they are allowed to make their own choices and set their own pace in the learning environment system. The experience ensures that the intrinsic motivation to learn can be maintained and leads to positive performance outcomes (Lee et al., 2010).

In general, cognitive theory is related to how humans think. In learning, educators believe that cognition and the learning process are mutually beneficial. In this field, the theory is utilised to explain behaviour by understanding the individual's thought processes (Mayer, 2001; Mayer, 2002). Once the thought processes are discovered, it is easier to formulate the educational settings. From the study of cognition, researchers aim to propose better methods for teaching and learning. This includes not only the format of the teaching and learning environment, but also how to convey the information effectively to learners, whether directly or indirectly (Mayer, 2002; Noor et al., 2011). A learning process will be more easily handled if the learners (adult learners) have some thoughts about the importance of the learning (Knowles, 1991). Previous studies on the human memory and information processing have revealed that well-organised learning materials such as multimedia technology learning materials cause the learners to develop and maintain interest in the lesson content (Lee & Boling, 1999). Furthermore, the use of virtual reality benefits the cognitive process as it can help learners to perform better in memorisation and comprehension and to see a simplified overall view of the lesson learned (Lee et al., 2010).

Emotional appeal is one of the important elements to be considered in designing and developing computer systems (David & Glore, 2010), but it is rarely discussed in the literature. When discussing emotional appeal in computer system design and development, one prominent aspect is the aesthetic look of the design. Aesthetics is a branch of philosophy related to art and beauty (Zhang, 2009). Aesthetics is also associated with human emotions, affects, feelings or moods whereby it influences how humans make judgements and form perceptions based on information they have received (David & Glore, 2010; Zhang, 2009). Fogg et al. (2003) found that over 45% of consumers made judgements about website credibility based on the aesthetics (including the layout, design, typography, colour and other factors).

2.3. Learning Outcomes

Learning outcomes focus on what the learners have gained by the end of the lesson or learning process. It is an indicator of whether or not a learner has increased their knowledge or skills. Satisfaction is an essential dimension in evaluating the outcome of a learning process especially when the process involved a new intervention such as the use of a computer system in the learning process (Zhu, 2011). Mayer (2001) discussed a plethora of strategies to enhance learners' satisfaction while they are interacting with a computer system, such as determining ways to improve the learning according to the learners' cognitive processes. Investigating performance after the learners have interacted with a system is another widely used method to measure their achievement, compared to the conventional method. This is normally conducted by means of evaluating the contents being used in a learning process, either by using the conventional method or the computer-based method.

3. Conclusion

This paper provides an overview of interactive media and persuasive technology for learning, particularly for the elderly. It focuses on the use of interactive media features and interactive persuasive elements that may encourage the elderly to learn a particular subject of interest by using computer-based learning application. This conceptual model includes the prominent interactive media features that may stimulate the elderly to learn by using the computer-based application. It also covers the features of the interactive media which may have an impact on persuasion. The conceptual model will be helpful for individuals or institutions needing to understand the important elements in encouraging the elderly to learn and what methods they prefer for learning through computer-based material. This model not only contributes to the body of knowledge in the computer learning field, but also supports the continuity of the learning habit with no age boundaries through the latest technology. The capabilities of interactive media in transferring knowledge interactively and attractively should be a platform for increasing knowledge in the society.

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